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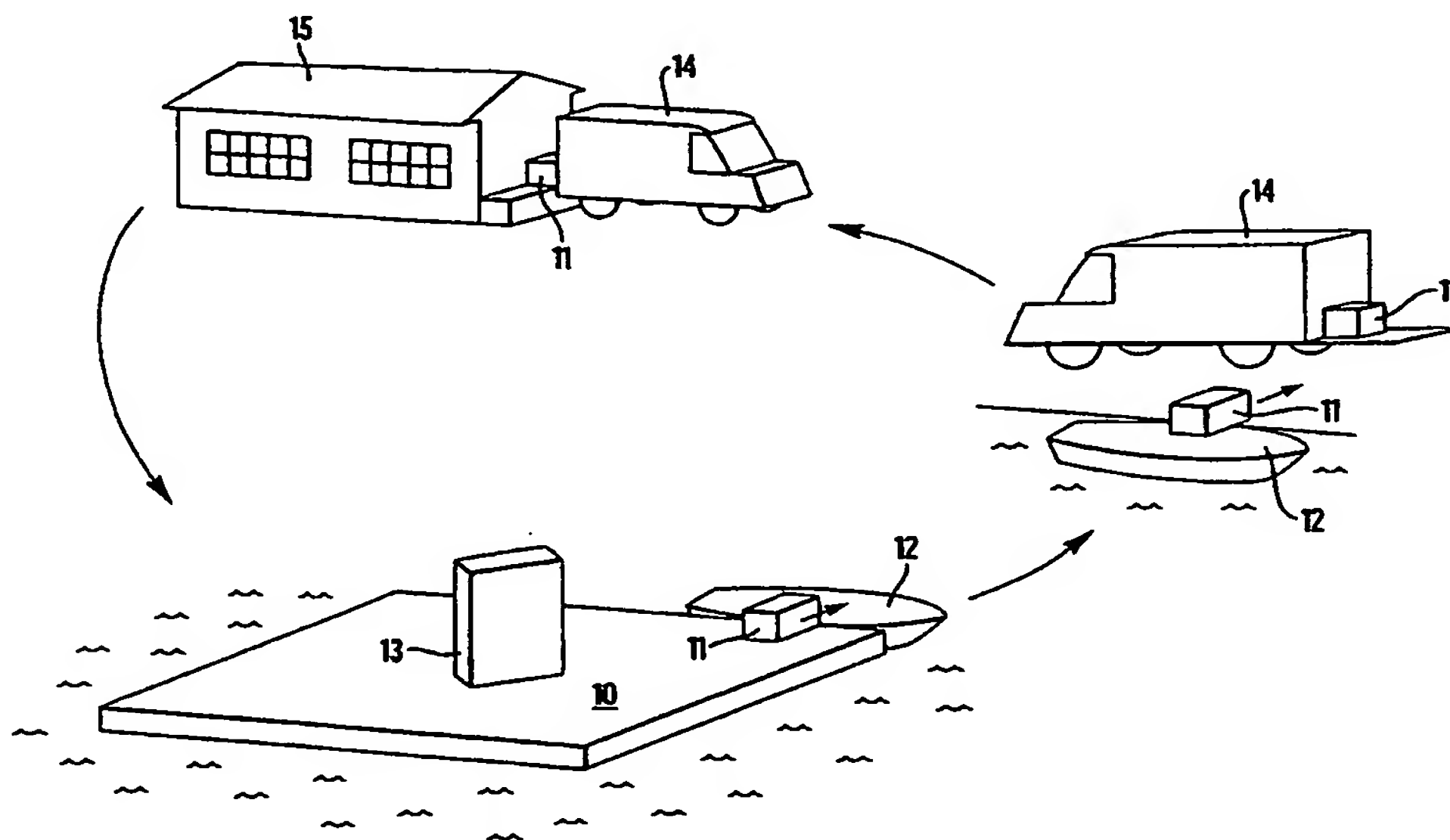
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(54) Title: SYSTEM FOR CULTURING MARINE LIFE AND GROWTH DEVICE FOR THIS PURPOSE



(57) Abstract: The present invention relates to a system for culturing marine life such as molluscs, shellfish, mussels, oysters and snails, together with a growth device for marine life such as molluscs, shellfish, mussels, oysters and snails, which growth device substantially utilises an accessible area in a marine environment in an optimal manner while the growth device is arranged for handling the growth device in a simple and cost-effective manner with regard to emptying, filling of spat or growth material, as well as any moving of the growth device during the growth period by having one end of the growth device provided with one or more bodies (3) which permit transport of the growth device on the fixed base.

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## System for culturing marine life and growth device for this purpose

The present invention relates to a system for culturing marine life such as molluscs, shellfish, mussels, oysters and snails and a growth device for this purpose, which growth device utilises an accessible area in a marine environment in an optimal manner while the growth device is arranged to be able to be handled in a simple and cost-effective manner with regard to maintenance, emptying, filling of spat or growth material, and the possible moving of the growth device during the growth period. Growth surfaces for use in the growth device are also described.

10 The use is known in the prior art of various structures which permit the culturing and breeding of shells and shellfish within a limited area, preferably on the seabed or generally in the marine environment. This is an industry in full growth and it is therefore desirable to make optimal use of those natural areas which are suited to this kind of culturing. These may be  
15 areas with particularly favourable water quality, nutrient content in the water, favourable sunlight conditions and otherwise stable current and growth conditions. Since the industry is in growth, focus is also placed on more efficient handling of such growth devices and in this regard it is particularly important to achieve efficient handling in connection with the process where  
20 the growth device is raised from the water for treatment in, e.g., a processing plant on land or on a ship as well as in connection with the deployment of prepared growth devices.

Among the known solutions in this connection, a raisable/submersible underwater platform has been developed which places growth devices at a  
25 desired depth, which, for example, may be 4 - 7 metres. Amongst other things, this helps to prevent attacks on the shellfish from naturally occurring creatures on the seabed. Such a platform can thereby, e.g. by means of buoyancy and/or ballast bodies, be brought to the surface, giving free access to the growth devices. Thus it is desirable to simplify and increase the  
30 efficiency of handling a growth device mounted on such a platform and moving it, e.g., to and from the platform.

From the known technical solutions, we further refer particularly to US 2,989,945 which describes a framed structure where a plurality of baskets containing shellfish or the like are placed inside the frame in a vertical  
35 direction, and where the framed structure is placed under water with a

buoyancy body holding the framed structure and the baskets of cultured shellfish at a distance above the seabed. Moreover, in US patent 4,061,110 a similar framed structure is described with open drawers for culturing of shellfish and the like. The frame with the shellfish is deployed and retrieved from the seabed by means of an ordinary crane and with respect to this it is assumed that a frogman or the like will be required in order, amongst other things, to secure the crane hook to the framed structure's lifting device which is mounted in the upper edge of the frame device. Furthermore, in US patent 4,621,588 a pyramid-shaped framed structure is described with a plurality of drawers placed one on top of the other, which drawers have a bottom structure which can be opened, thus enabling the contents of a drawer to fall down into the drawer beneath. It will thereby be possible to place spat and growth material in the top drawer after it has been emptied, whereupon the contents of the various drawers are moved from above in the downward direction from drawer to drawer and the bottom drawer (which is the largest) is then pulled out, since it contains the largest shells and this drawer can then be emptied in a processing plant. The disadvantage of this growth device, however, is that it undergoes a continuous process and in some cases it is desirable to exploit the special growth conditions which arise at certain times of the year instead of harvesting continuously. Furthermore, emptying and filling the growth device is a cumbersome task.

Moreover, in international patent application WO 83/03947 a device is described for culturing shellfish, which device substantially consists of a framed structure which protects the shellfish against fish and other predatory creatures which may live on shellfish. This structure will also be able to protect the growth device against undesirable objects carried on the current and the water.

Furthermore, in US patent 3,741,159 an anchored, floating (at a specific depth) basket device is described for culturing shellfish, etc. A similar moored structure is described in US patent 3,702,599 and the design of yet another solution is described in US patent 3,870,019.

All of the above-mentioned known technical solutions are intended either to be placed stationed on the seabed or placed at a distance above the seabed by means of, e.g., a float.

Compared to known solutions which enable a growth device/collector for shellfish to be moved, in US patent 3,561,150 a device is described, along the bottom of which runners are mounted, which device can be dragged along the seabed in order to locate creatures living on the seabed and shellfish.

5 Moreover, in US patent 4,813,377 a simple device is described substantially in the form of a rectangular basket, which is pulled along the seabed for harvesting shellfish and the like. The device is provided with wheels.

Furthermore, in US patent 4,827,635 a gathering device is described which is provided with runners, which device can be pulled along the seabed in order  
10 to harvest molluscs, etc.

The common feature of the known technical solutions is that they do not offer very efficient handling after the device has been raised above the water, particularly in connection with the situation where, e.g., a growth device has to be moved into and internally in a processing plant where the growth device  
15 is emptied of fully developed shellfish and then cleaned ready to be prepared once again for deployment.

With regard to this, the object of the present invention is to provide a system for handling of one or more growth devices which are used for culturing marine life such as molluscs, shellfish, mussels, oysters and snails. The  
20 system offers efficient and simple handling of growth devices which are mounted on a fixed base such as, e.g. a submersible platform or the like, particularly in connection with transport to and from the processing site. A further object of the present invention is to provide a growth device which to a great extent utilises the accessible area for breeding shells and shellfish and  
25 it is also an object of the device according to the present invention that it should be able to be located at a desired depth according to the prevailing conditions at the location in order to achieve optimal water and sunlight conditions. An additional object of the device according to the present invention is that it should be capable of being easily raised and lowered to  
30 and from the surface in order to bring the growth device to a processing site, e.g. on board a boat or on land, and in this connection it is an object of the present invention that it should be capable of being moved into, at and inside a processing site in a simple and efficient manner. A growth surface is also described in the form of a body such as a surface or a vessel or basket-shaped  
35 body where spat and growth material are placed and grow into fully developed shellfish. In a preferred embodiment one or more such growth



surfaces are releasably located one on top of the other in order to exploit the effective growth zone in the water in an optimal manner.

The present invention will preferably, but not exclusively, be able to be used in connection with a submersible platform structure as indicated above.

5 A system for culturing marine life such as molluscs, shellfish, mussels, oysters and snails according to the present invention is set forth in the introductory part of the following claim 1 with characterising features as set forth in the characterising part of claim 1. Further embodiments are set forth in claim 2. A device according to the present invention which meets the  
10 above-mentioned objects and avoids the disadvantages and defects encumbering the previous known solutions is set forth in the introductory part of the following independent claim 3, which characterising features as set forth in the characterising part of the following claim 3. Further  
15 embodiments of the device according to the present invention are also set forth in the dependent claims. Furthermore, a growth surface in connection with the present invention is also set forth.

The system according to the present invention comprises a raisable and submersible platform disposed at a suitable location in the water, which platform has an upper fixed base where one or more growth devices are  
20 movably mounted, in which growth devices there are arranged one or more growth surfaces, and which growth device is in the form of a framed structure where the growth surfaces are releasably mounted. The system is characterized in that the growth device is provided with bodies which permit the growth devices to be freely moved on the fixed base, that in connection  
25 with the platform there may be provided a transition to a production or processing site for the shellfish cultured in the growth device, which transition has a fixed base where the growth devices can be moved and that in a connected processing site there is a fixed base where the growth devices can be freely moved. The transition between the platform and the processing  
30 site may be a bridge, a ship's deck, a vehicle or the like.

The growth device according to the present invention is employed substantially for culturing of marine life such as molluscs, shellfish, mussels, oysters and snails, in addition to any other culturable products of the salt or fresh water area, which growth device substantially consists of a framed  
35 structure with one or more growth surfaces substantially releasably located

on top of one another, which growth surfaces are arranged at intervals which permit water to flow through and sunlight to gain access, where one end of the growth device according to the present invention is provided with bodies which permit transport of the growth device on a fixed base. In the preferred embodiment, moreover, these bodies for transport of the growth device on a fixed base are wheels, since these permit the growth device to be very easily transported on the fixed base, but in alternative embodiments the bodies may be different kinds of runners or skis which also enable the growth device to be pulled along the bottom. In an embodiment of the growth device according to the present invention where wheels are employed, these wheels may further be provided with locking mechanisms which prevent the growth device from moving as the wheels can be locked. For this purpose a great many different, commonly known locking mechanisms can be used which lock the wheels by securing, blocking, friction, various types of brake devices or the like. If runners or skis are used, devices may also be provided which prevent the growth device from moving by the devices engaging with the base, e.g. by taking the load off the runners and skis partially with a friction cushion against the base or locking mechanisms which partially penetrate the base, thereby checking the growth device and preventing undesirable movement on the base.

In the preferred embodiment the bodies which permit the movement of the growth device on a fixed base are preferably located at the growth device's lower end, but in alternative embodiments the wheels may be mounted along any of the growth device's surfaces or ends, which may result in the growth device having to be placed on its side or tilted during transport. However, this will be on condition that the growth device is designed in such a manner that the contents of the releasably mounted growth surfaces are prevented from falling out of the growth surfaces, while the growth device's framed structure is such that the frames do not move or fall out of the framed structure in an undesirable manner.

The growth device according to the present invention may also be placed on the seabed, but in a number of different embodiments it will be expedient to place the growth device at a predetermined depth which provides optimal growth conditions, such as by placing it on a submersible platform structure or one or more buoyancy bodies may be employed which possibly together with an anchoring device keep the growth device at the correct depth. Such

buoyancy bodies may be selected from commonly known technical solutions, such as, e.g., that described in the above-mentioned previously known US patent 2,989,945. In an embodiment it may also be relevant to place the buoyancy body in close contact with the growth device's upper or lower part, but in the preferred embodiment the buoyancy body is placed at a distance from the growth device, e.g. beside an intermediate connecting line of rope, wire, chain or the like in order to prevent the buoyancy body or bodies from blocking the sunlight or in some other way disturbing the growth conditions in the area where the growth device is placed.

Furthermore, the growth device according to the present invention can be adapted to a hoisting device, with one or more hooks, one or more eyes or a suspension loop of chain, wire, rope or the like being provided at the upper end of the growth device. This also enables the growth device to be raised out of the water and deployed in the water by means of a commonly known hoisting device such as a crane structure or the like.

The advantages provided by the characterising features of the growth device according to the present invention are further associated with the fact that, after being raised from the water, the growth devices will be placed on a fixed base, whereupon they will be able to be moved on the fixed base manually or by means of a winch or a vehicle to, e.g., a processing station for the products which are cultured in the growth device. In an alternative handling method, e.g. in an area where the bottom slopes very gradually, one or more growth devices may also be placed on the seabed, whereupon they are pulled along the seabed up to the water's edge and on a fixed base moved to a processing site for the growth device. The processing site may also be located on board a ship where one or more growth devices are moved by the said bodies according to the present invention on to the ship's deck or the ship's hold between the place where the growth device comes out of the water and the place or places where the growth device is to be processed.

The growth surfaces which are used in connection with the growth device may be of different shapes and in an embodiment may be a flat surface with lateral edges, with the result that the growth surfaces are in the form of a box or a vessel. The vessel may be watertight or in an embodiment it may be provided with holes in the side walls in order to increase the through-flow.

The vessel may further be composed of a net material which provides

extremely good through-flow. In a further preferred embodiment a net-shaped vessel is placed in a lower watertight vessel. This ensures a good through-flow in the vessel's upper part while the water level in the vessel's watertight part will remain relatively stable. When the inner net-shaped vessel is lifted out of the watertight vessel after being removed from the water, for natural reasons it will be drained. The choice of vessel design depends on the type of shellfish which has to be cultured, such as, e.g., scallops, abalone, mussels, oysters, etc.

The growth device according to the present invention is further exemplified and explained by closer reference to the attached figures, in which:

fig. 1 is a schematic layout drawing of the system according to the present invention;

fig. 2 is a perspective view of a growth device according to the present invention;

fig. 3 illustrates a further embodiment of a growth device according to the present invention;

fig. 4 illustrates a growth surface for use in the growth device;

fig. 5 illustrates a growth surface with lateral edges for use in the growth device;

figs. 6 - 9 illustrate further embodiments of growth surfaces according to the present invention.

In figure 1 an embodiment of the system according to the present invention is illustrated where a raisable/submersible platform 10 is placed in water and illustrated in the raised position. The platform 10 is controlled by a control tower 13 and a growth device 11 is illustrated mounted on the platform 10. The platform 10 has a fixed base where the growth device 11 can freely be moved on its bodies which permit movement, such as wheels, runners or the like. According to the system the growth device 11 is transferred to a boat or barge 12 which transfers the growth device 11 to a lorry 14. The growth device 11 is then transported to a production site 15 where the growth device is emptied and processed and returned to the platform 10.



In figure 2 there is further illustrated a growth device consisting of a frame 1 with horizontally mounted rails 2 where two or more growth surfaces 4 are arranged one on top of the other in the vertical direction. According to the present invention the growth device is further provided with wheels at its lower end to enable the growth device to be moved on the fixed base.

Fig. 3 substantially illustrates an embodiment of a growth device according to the present invention consisting of a frame 1 substantially composed of two frame sides provided with sliding surfaces or rails 2 where a number of growth surfaces 4 can be placed one on top of the other in the vertical direction. The growth surfaces may further be of the type which is indicated in fig. 4, which are substantially flat, or as illustrated in fig. 5, the growth surface may have straight or sloping lateral edges 5 of a desired and suitable height.

Alternatively, the growth surfaces may also be in the form of through-flowable baskets 7 as illustrated in figure 6 or boxes/vessels with lateral edges 5 and holes 8 disposed in the lateral edges 5 for the through-flow of water as illustrated in figure 7, or only watertight lateral edges 5 as illustrated in figure 8. Furthermore, these can be combined in such a manner that the growth surfaces are in the form of a through-flowable basket 7 in a box or a vessel with lateral edges 5 as illustrated in figure 9. Here the basket 7 can also be lifted out of the vessel with the lateral edges 5.

In figures 6 - 9, moreover, the growth surfaces in a preferred embodiment are shown in the form of suspension devices 9 along the upper edges of the longitudinal side. This is particularly advantageous since it makes it easy to pull the growth surfaces along the rails 2 in the frame 1 when the growth surfaces have to be released or installed in the growth device.

According to the present invention, moreover, the frame 1 is provided at its lower end with wheels 3, which illustrates an embodiment of the invention as mentioned above and in connection with the wheels 3 there are also provided additional supporting devices 6 with additional wheels or runners. Thus according to the invention it is possible to move the growth device's frame 1 along a fixed base on the wheels 3, further supported by the support devices 6.

The above description, with the support of the attached drawings, is only an example of embodiments of a growth device according to the present invention and therefore should not be considered to be limiting for the scope of the patent's protection.

## PATENT CLAIMS

1. A system for culturing marine life such as molluscs, shellfish, mussels, oysters and snails where a raisable and submersible platform (10) is employed disposed at a suitable location in water, which platform (10) has an upper fixed base where one or more growth devices (11) are movably mounted, characterized in that on the growth devices (11) there are placed one or more growth surfaces, and which growth device (11) is in the form of a framed structure where the growth surfaces are releasably placed and the growth device (11) is provided with bodies which enable the growth devices (11) to be freely moved on the fixed base and that in connection with the platform (10) a transition (12) may be provided to a production or processing site (15) for the shellfish which are cultured in the growth devices (11), which transition (12) has a fixed base where the growth devices (11) can be moved, and that in a connected processing site (15) there is a fixed base where the growth devices (11) can be freely moved.
2. A system according to claim 1, characterized in that the transition (12) between the platform (10) and the processing site (15) is one or more successive elements such as a bridge, a ship's deck or a vehicle.
3. A growth device for marine life such as molluscs, shellfish, mussels, oysters and snails, which growth device substantially consists of a framed structure (1) with rails or holders (2) for one or more growth surfaces (4) mounted at intervals substantially one on top of the other, characterized in that one end of the growth device is provided with one or more bodies (3) which permit transport of the growth device on the fixed base.
4. A growth device according to claim 3, characterized in that the bodies (3) are wheels.
5. A growth device according to claim 3, characterized in that the bodies (3) are runners.

6. A growth device according to claims 4-5,  
characterized in that support devices (6) are provided in connection with the  
bodies (3).
7. A growth device according to claims 3-6,  
5 characterized in that the bodies (3) are preferably mounted at the lower end  
of the growth device.
8. A growth device according to claims 3-7,  
characterized in that the shape of the growth surfaces is chosen from a group  
substantially consisting of the following shapes; flat surface, flat surface with  
10 lateral edges, box-shaped, vessel-shaped, a through-flowable basket, or  
combinations of these.
9. A growth device according to claims 3-8,  
characterized in that the device is connected to one or more buoyancy bodies.
10. A growth device according to claims 3-9,  
15 characterized in that the device is adapted at its upper end to a hoisting  
device by a hook..
11. A growth device according to claims 3-10,  
characterized in that the device is adapted at its upper end to a hoisting  
device by an eye.
- 20 12. A growth device according to claims 3-10,  
characterized in that the device is adapted at its upper end to a hoisting  
device by a suspension loop.



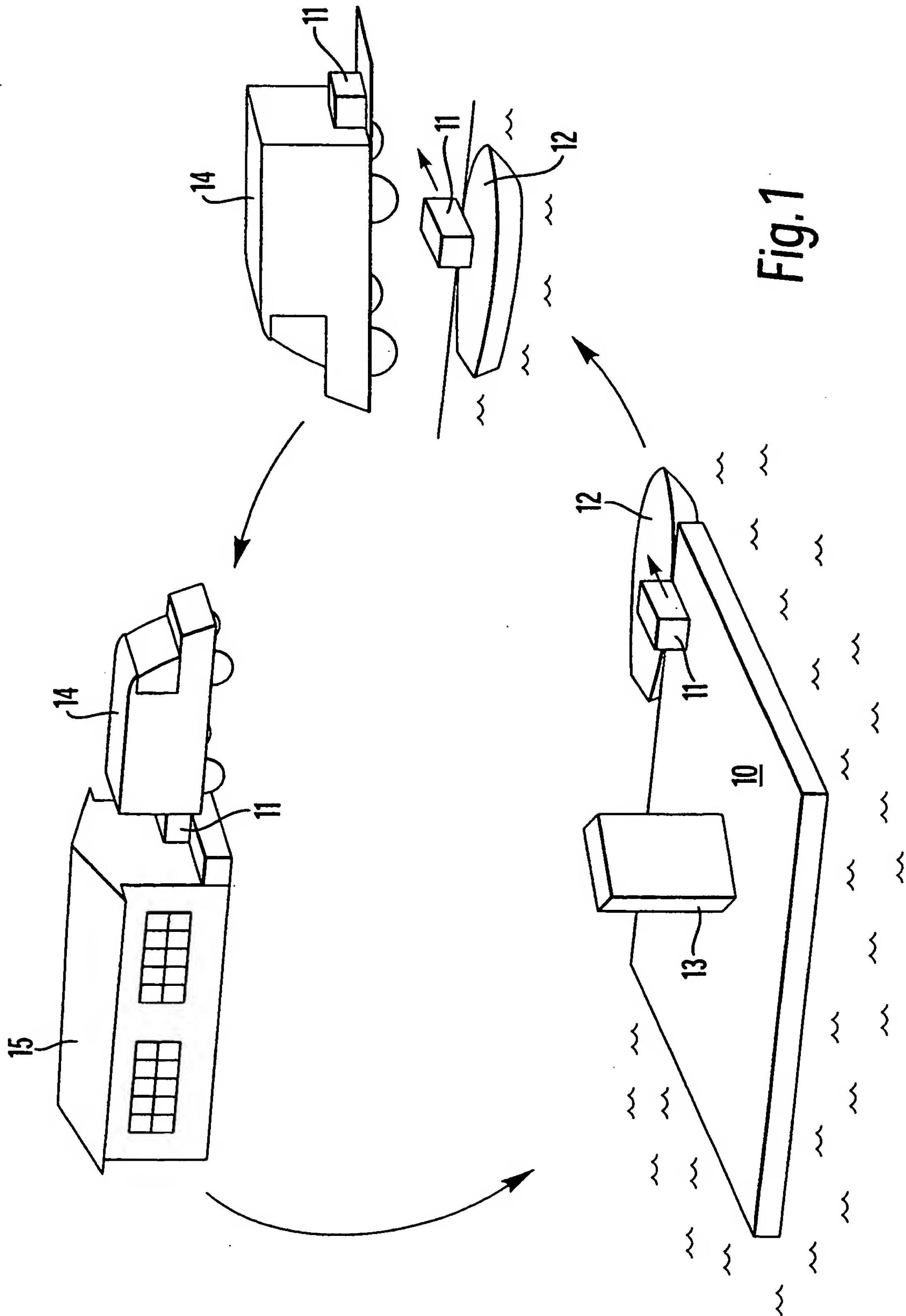


Fig. 1

2/4

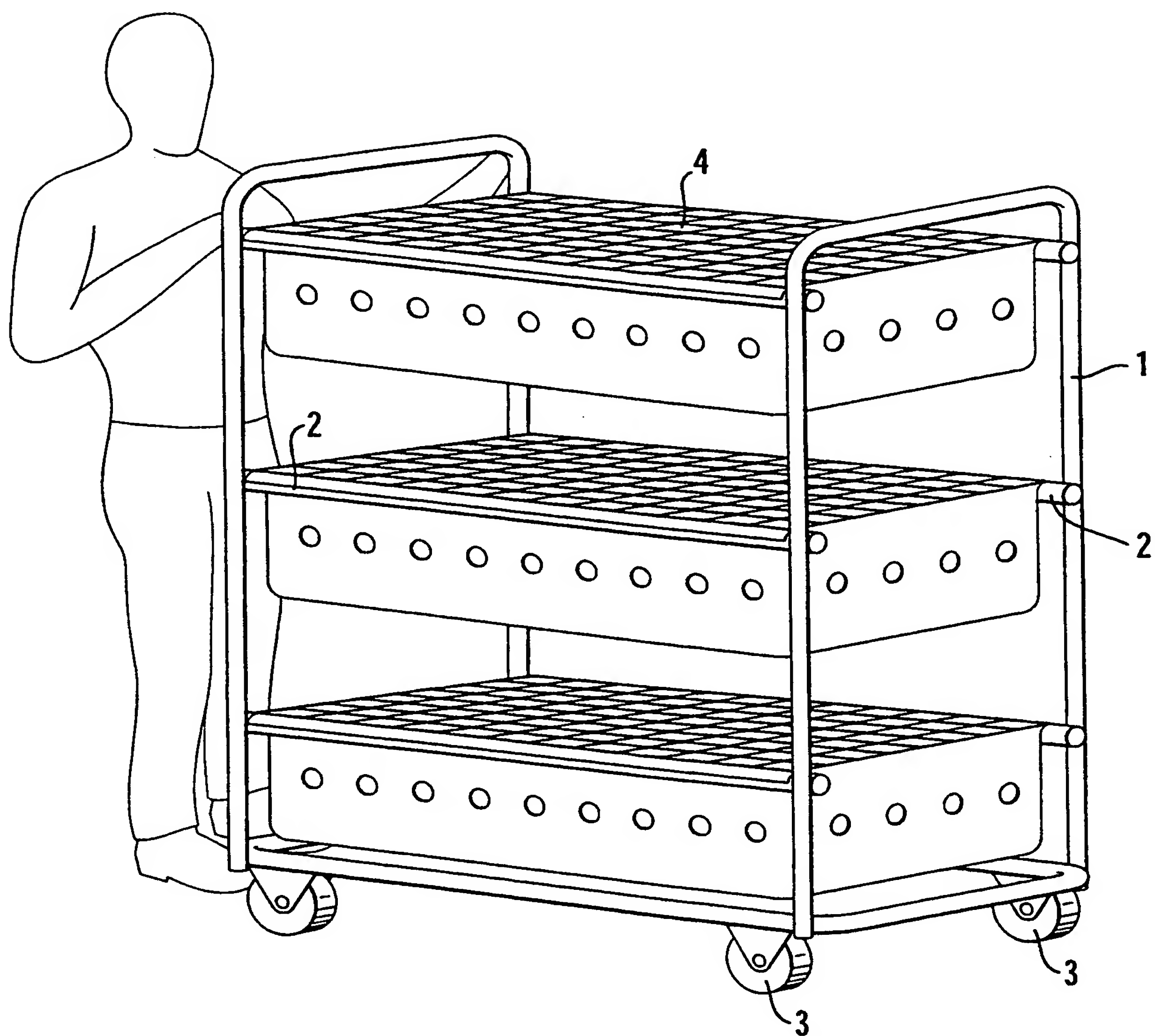


Fig.2

3/4

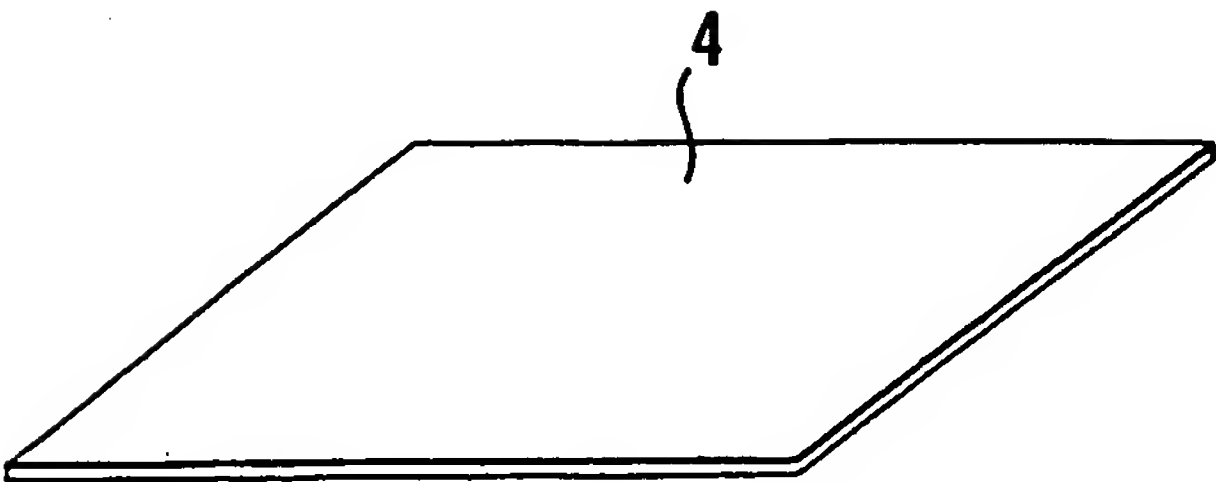


Fig. 4

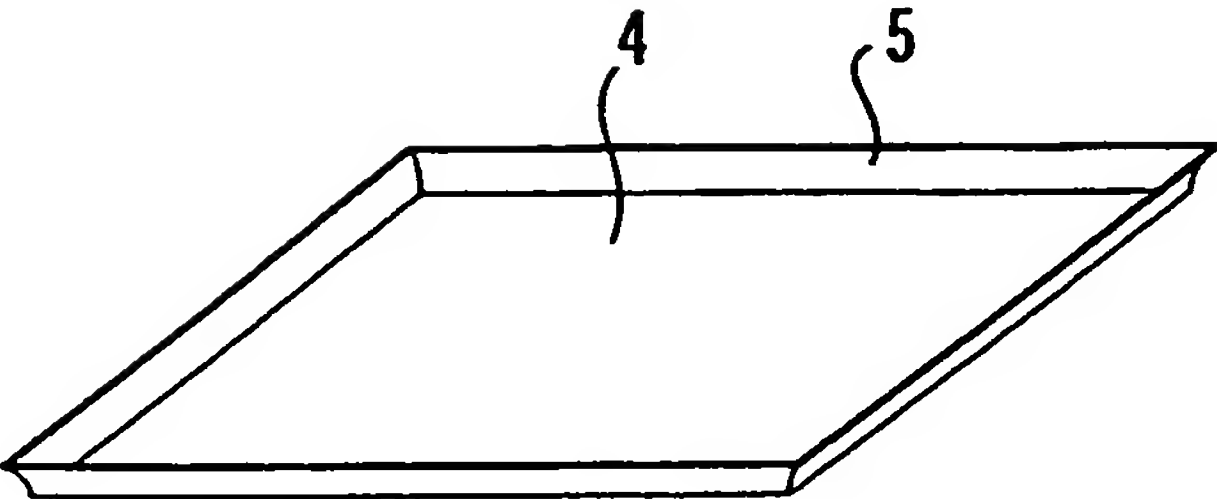


Fig. 5

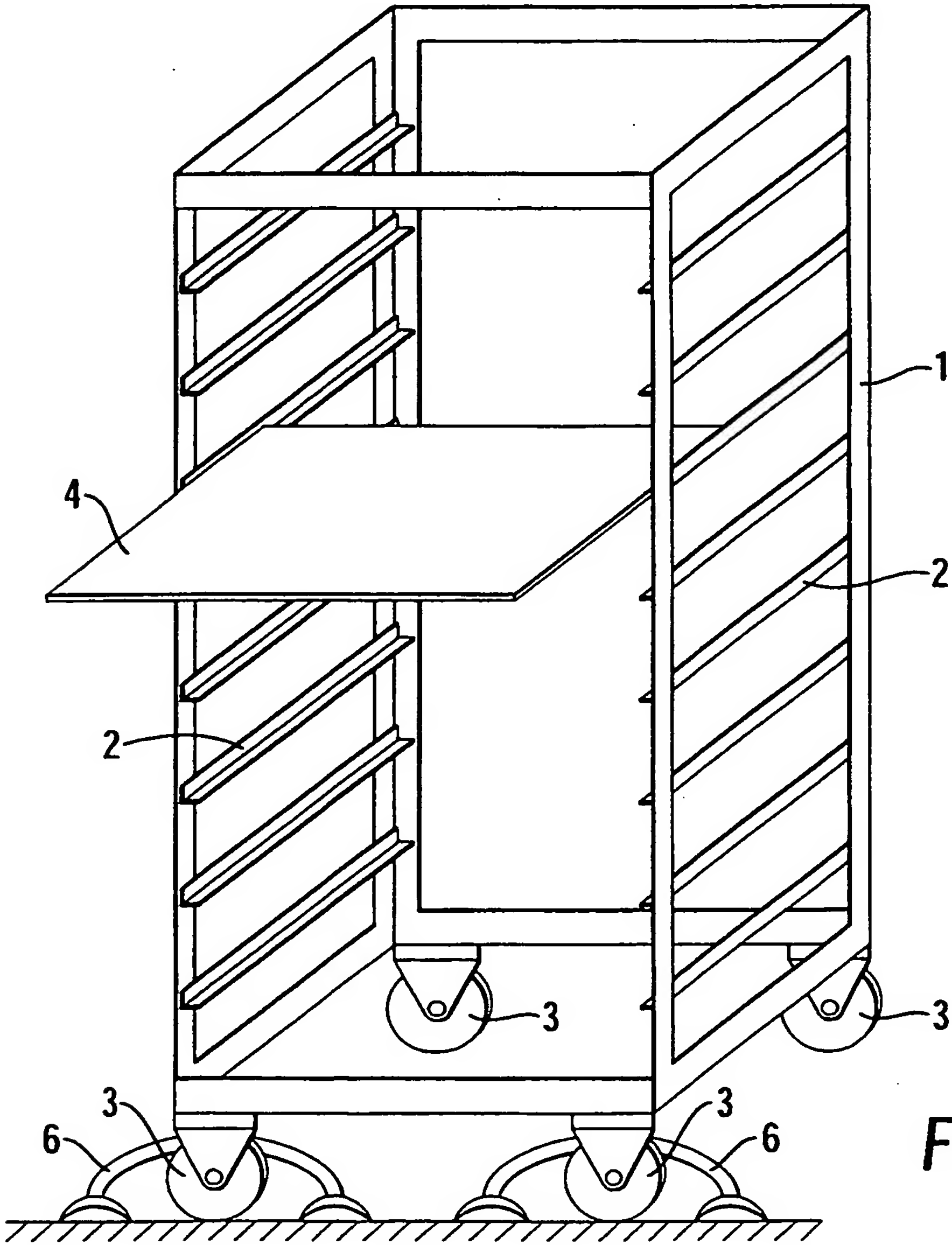


Fig. 3

4/4

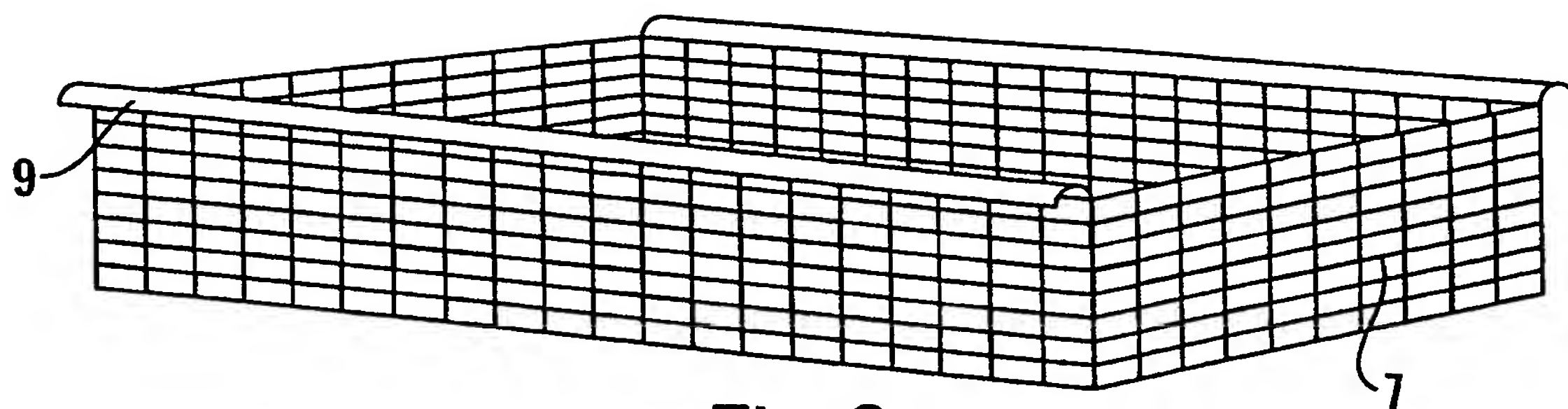


Fig. 6

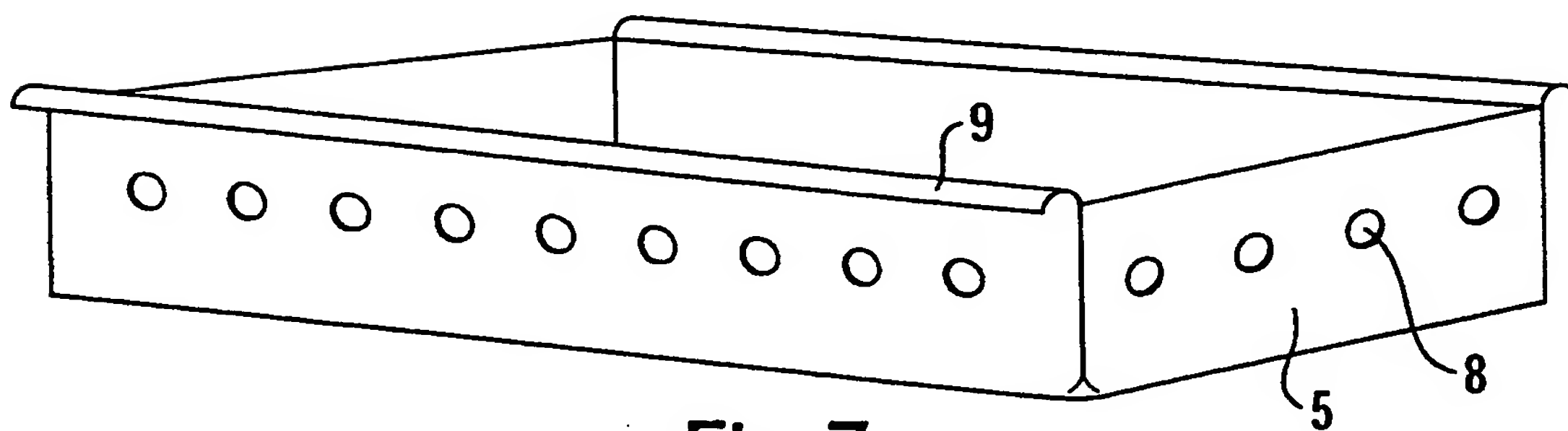


Fig. 7

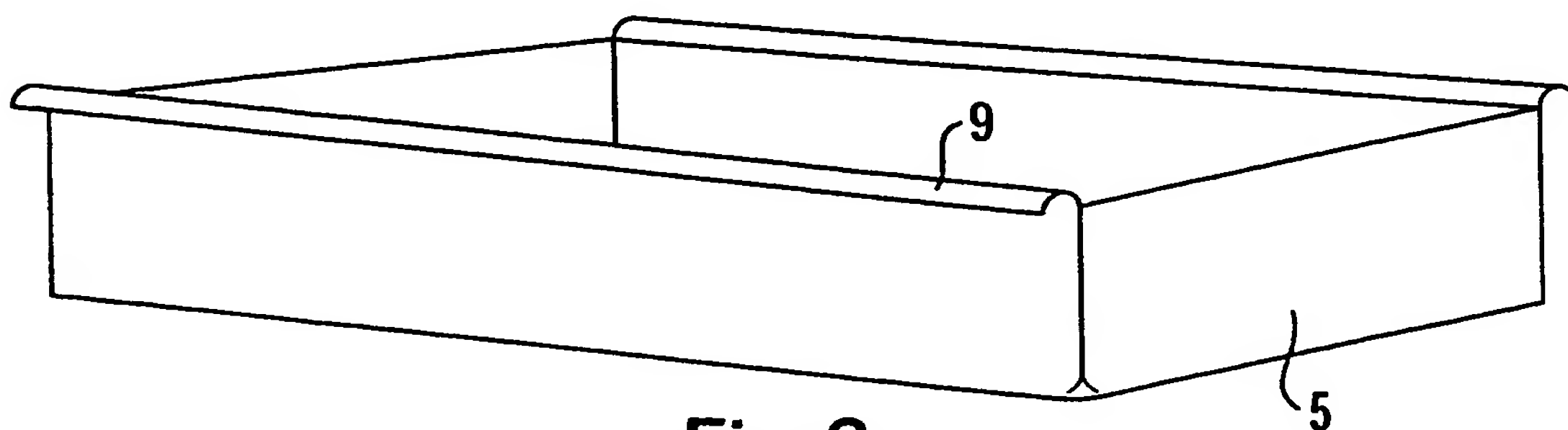


Fig. 8

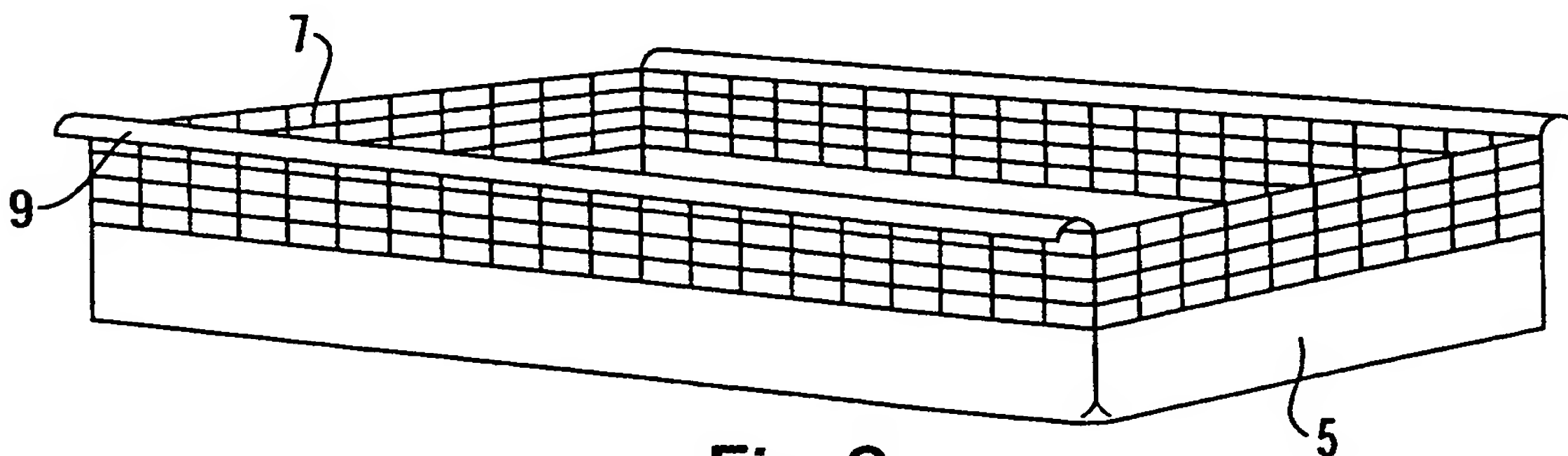


Fig. 9



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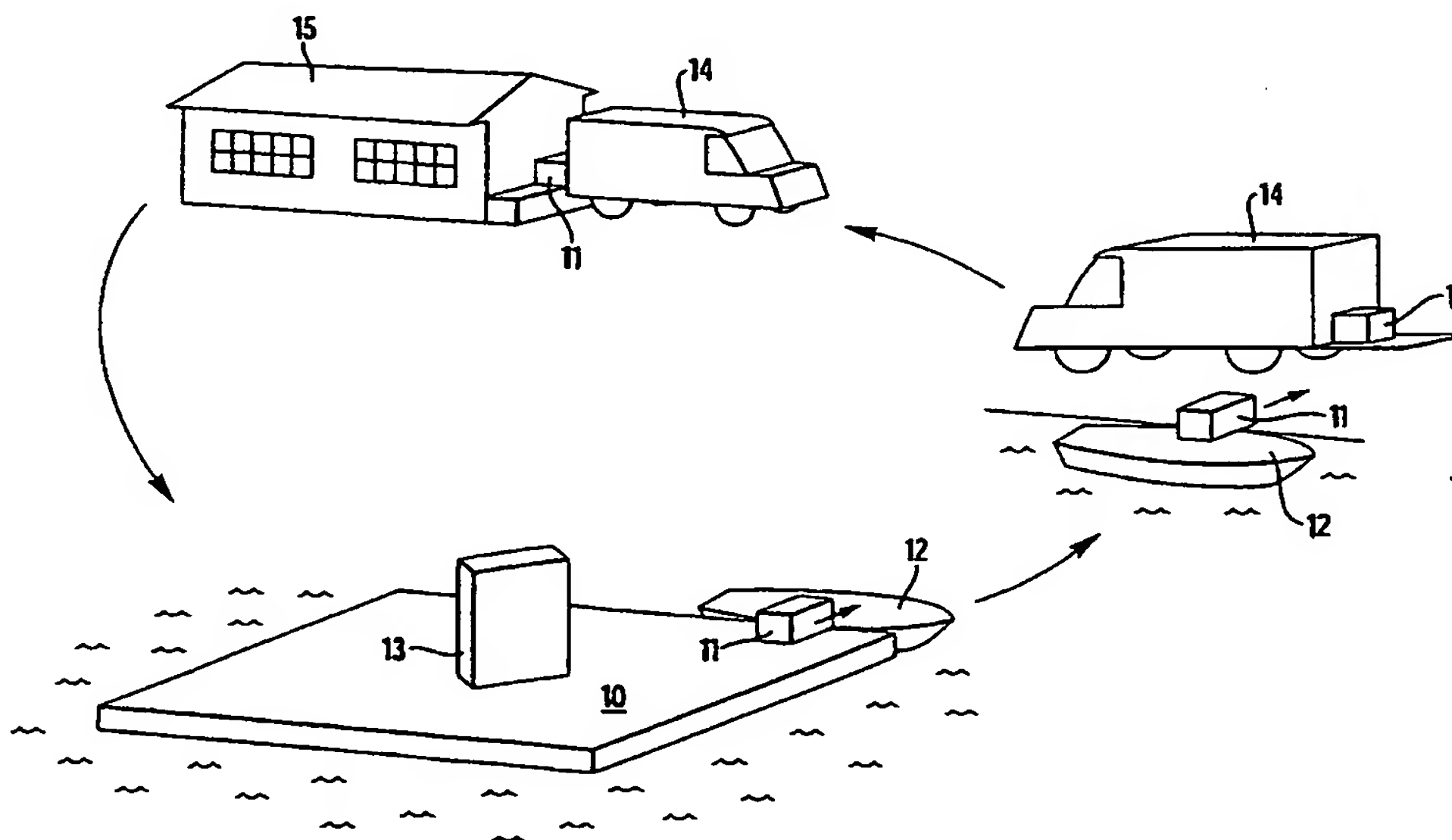
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(54) Title: **SYSTEM FOR CULTURING MARINE LIFE AND GROWTH DEVICE FOR THIS PURPOSE**



(57) Abstract: The present invention relates to a system for culturing marine life such as molluscs, shellfish, mussels, oysters and snails, together with a growth device for marine life such as molluscs, shellfish, mussels, oysters and snails, which growth device substantially utilises an accessible area in a marine environment in an optimal manner while the growth device is arranged for handling the growth device in a simple and cost-effective manner with regard to emptying, filling of spat or growth material, as well as any moving of the growth device during the growth period by having one end of the growth device provided with one or more bodies (3) which permit transport of the growth device on the fixed base.

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## A. CLASSIFICATION OF SUBJECT MATTER

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## B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5628280 A (J.D. ERICSSON), 13 May 1997 (13.05.97), column 7, line 1 - line 50; column 8, line 46 - column 9, line 54, figures 1-6, abstract --	1-12
Y	US 239592 A (D.G. WEEMS), 29 March 1881 (29.03.81), page 1, line 12 - line 64, figures 1-3 --	1-2
Y	US 4886286 A (R.B. WHORTON, III), 12 December 1989 (12.12.89), column 1, line 60 - column 2, line 60, figures 2-5, abstract --	3-12

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Date of the actual completion of the international search

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 01/00159

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